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SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			KIM, DAVID S	
			ART UNIT	PAPER NUMBER
			2633	

DATE MAILED: 05/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/771,660

Applicant(s)

HAZELL ET AL.

Examiner

David S. Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### Claim Objections

1. **Claims 1, 4, 7-8, 11-12, and 14-19** are objected to because of the following informalities:

Claim 1 uses "wherein said optical carries a wavelength band" where -- wherein said optical path carries a wavelength band -- may be intended.

Claims 4, 7-8, 11-12, 14-17, and 19 are presently written as multiple dependent claims, but amendments filed on 30 January 2001 changed all of these claims to single dependent claims. As presently written, some of these multiple dependent claims depend on each other. Thus, some of these multiple dependent claims are also in improper form because a multiple dependent claim cannot depend on other multiple dependent claims. Examiner assumes that Applicant desires consideration of claims 4, 7-8, 11-12, 14-17, and 19 as single dependent claims, according to the amendments filed on 30 January 2001. Thus, Examiner treats the merits of claims 4, 7-8, 11-12, 14-17, and 19 according to the claim dependency shown in the amendments filed on 30 January 2001.

Claim 18 uses "the optical reflector" where -- an optical reflector -- may be intended. Another possible intention is that claim 17 is supposed to depend on claim 16, instead of depending on claim 9. Otherwise, antecedent basis is lacking.

Appropriate correction is required.

### Claim Rejections - 35 USC § 112

2. Applicant's compliance with the rejection of claims 22-23 in the previous Office Action (mailed on 05 October 2004) is noted and appreciated. Claims 22-23 are presently cancelled, so the previous rejections are moot.

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. **Claim 4** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the

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specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Note the following limitations in independent claim 1:

“applying dispersion compensation over at least one optical path, wherein said optical [path] carries a wavelength band...., thereby applying dispersion compensation to said *wavelengths outside said wavelength band*” (underlined portion introduced by Applicant’s response filed on 05 January 2005, bold and italic emphasis Examiner’s).

These limitations limit the scope of Applicant’s claimed invention to the embodiment shown in Fig. 5, which employs a photorefractive element or diffraction grating to provide dispersion compensation (p. 6-7, bridging paragraph). In contrast, claim 4 states, “dispersion compensation is provided by means of a number of lengths of *dispersion compensating optical fibre*.” This limitation corresponds to the embodiment shown in Fig. 1 and described on p. 5, middle paragraph. Since the specification does not disclose the use of dispersion compensating optical fibre (dependent claim 4) in the embodiment shown in Fig. 5 (independent claim 1), claim 4 contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

As a remedy, Examiner directs attention to independent claim 9, which includes the following limitation:

-- applying dispersion compensation to *the predetermined wavelength band independently of wavelengths outside the predetermined wavelength band* -- (emphasis Examiner’s).

In view of the similar language of independent claim 9, Examiner respectfully suggests the following claim language for independent claim 1:

-- applying dispersion compensation to said *wavelength band independently of wavelengths outside said wavelength band* -- (emphasis Examiner’s).

Such a suggested amendment would result in broadening the scope of independent claim 1 to include the embodiments shown in both Figs. 1 and 5. Then, claim 4 would properly read on the embodiment shown in Fig. 1.

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5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. **Claims 1-8** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In the last two lines, independent claim 1 recites the limitation:

“applying dispersion compensation to *said wavelengths outside said wavelength band*”

(emphasis Examiner’s).

There is insufficient antecedent basis for this limitation in the claim. Rather, it appears that Applicant may intend to claim:

-- applying dispersion compensation to said *wavelength band independently of* wavelengths outside said wavelength band -- (emphasis Examiner’s).

Compare with independent claim 9.

7. **Claims 2-3** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Note the following limitation in dependent claims 2-3:

“splitting the *plurality of channels* into two or more wavelength bands.”

Independent claim 1 introduces at least two *pluralities of channels*: “an optical signal having a *number of channels* separated by wavelength” and “a *plurality of channels* numbering less than the total number of channels in the optical signal.” The “plurality of channels” in claims 2-3 can refer to either plurality of channels in claim 1 for antecedent basis. Thus, this limitation is unclear and indefinite.

**Claim Rejections - 35 USC § 102**

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

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applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. **Claims 1-3, 5-7, 9-14, and 16** are rejected under 35 U.S.C. 102(e) as being anticipated by Bergano (U.S. Patent No. 6,137,604).

**Regarding claim 1**, Bergano discloses:

A method of dispersion compensation (Fig. 7) comprising the steps of:

receiving an optical signal having a number of channels separated by wavelength (WDM signal input into fiber 701); and,

applying dispersion compensation (fiber grating 704) over at least one optical path (e.g., transmission path in Fig. 1, path exiting port 720), wherein said optical carries a wavelength band (channels 6-10 as in Fig. 4, col. 6, l. 31-33) which spans a plurality of channels numbering less than the total number of channels in the optical signal, thereby applying dispersion compensation to said wavelengths outside (channels 1-5 as in Fig. 4, col. 6, l. 28-30) said wavelength band.

**Regarding claim 2**, Bergano discloses:

A method according to claim 1, further comprising the steps of:

splitting the plurality of channels into two or more wavelength bands (fiber grating 704 splitting WDM input into a band of channels 1-5 and a band of channels 6-10);

propagating the two or more wavelength bands along separate optical paths (one path back toward circulator 703 and one path toward fiber grating 705), wherein dispersion compensation is applied in at least one of the optical paths (fiber grating 705); and, subsequently re-combining the signals at an optical output (output of circulator 703).

**Regarding claim 3**, Bergano discloses:

A method according to claim 2, in which the signal carried by at least one of the optical paths is amplified to compensate for losses (amplifiers 103 along transmission path in Fig. 1).

**Regarding claim 5**, Bergano discloses:

A method according to claim 1, including the step of:

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passing the entire optical signal (via optical circulator 703) through a band-selective dispersion compensation element (fiber grating 704) adapted to apply dispersion compensation only to channels within a predetermined wavelength band.

**Regarding claim 6,** Bergano discloses:

A method according to claim 5, in which channels outside the predetermined wavelength band are reflected by a separate optical element (fiber grating 705).

**Regarding claim 7,** Bergano discloses:

A method according to claim 5, in which the dispersion compensating element is a photorefractive element or a diffraction grating (col. 8, l. 40-47 shows fiber grating 704 to be a diffraction grating).

**Regarding claim 9,** Bergano discloses:

A dispersion compensation device (Fig. 2 or 7) for applying dispersion compensation to an optical signal having a number of channels (WDM signal input into fiber 201 or 701), comprising a dispersion compensation element (fibers 205 or fiber grating 704) which is configured to apply dispersion compensation to at least one optical path (inputs into fibers 205 or path from port 720) carrying a predetermined wavelength band (e.g., band 1 in Fig. 2, channels 1-5 as in Fig. 4, col. 6, l. 28-30) spanning a plurality of channels numbering less than the total number of channels of the optical signal, thereby applying dispersion compensation to the predetermined wavelength band independently of wavelengths outside the predetermined wavelength band.

**Regarding claim 10,** Bergano discloses:

A device according to claim 9, further comprising a band splitter (splitter 203 with filters 204) arranged to feed two or more optical paths, wherein least one of optical paths comprises a dispersion compensation element (fibers 205).

**Regarding claim 11,** Bergano discloses:

A device according to claims 9, in which the dispersion compensation element comprises a length of dispersion compensating optical fibre (fibers 205).

**Regarding claim 12,** Bergano discloses:

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A device according to claim 9, further comprising an optical coupler (optical circulator 703) arranged to feed an optical signal received at an optical input to an optical path having a dispersion compensation element (fiber grating 704), the dispersion compensation element being adapted to apply dispersion compensation to a number channels within a limited bandwidth and reflect signals within that bandwidth to an optical output of the optical coupler.

**Regarding claim 13,** Bergano discloses:

A device according to claim 12, in which the optical coupler is an optical circulator (optical circulator 703).

**Regarding claim 14,** Bergano discloses:

A device according to claim 9, in which the dispersion compensation element is a diffraction grating (col. 8, l. 40-47 shows fiber grating 704 to be a diffraction grating).

**Regarding claim 16,** Bergano discloses:

A device according to claim 9, in which the dispersion compensation device further comprises an optical reflector (fiber grating 705) coupled to the dispersion compensating element to reflect optical signals outside of the predetermined bandwidth to the optical output of the optical coupler.

**Claim Rejections - 35 USC § 103**

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the



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examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. **Claims 8 and 17-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergano in view of Ramaswami et al. (*Optical Networks: A Practical Perspective*, hereinafter "Ramaswami").

**Regarding claim 8**, Bergano discloses:

A method according to claim 1, further comprising the step of:

imposing a uniform delay to a particular wavelength band (note that a temporal delay occurs in the fiber portion between the wavelength band reflected by fiber gratings 704 and the wavelength band reflected by fiber grating 705).

Bergano does not expressly disclose:

imposing a uniform delay to a particular wavelength band *to compensate for relative dispersion between the particular wavelength band and a second different wavelength band*.

However, it is well known that relative dispersion (col. 1, l. 21-24) results from the effect of light at different wavelengths traveling at different velocities within optical fiber, as shown by Ramaswami (p. 227). As the different wavelength bands of Bergano (band of channels 1-5 and band of channels 6-10 in Fig. 4) encounter different amounts of dispersion compensation in their respective dispersion compensation elements, it inherently follows that the temporal positions of the propagating signals in these wavelength bands may shift with respect to each other, resulting in relative dispersion between different bands. In other words, for example, one signal in one wavelength band maybe temporally misaligned, or "out of phase," relative to another signal in another wavelength band. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to compensate for such relative dispersion between the different wavelength bands by imposing an appropriate amount of uniform delay (length of the fiber portion between the wavelength band reflected by fiber gratings 704 and the wavelength band reflected by fiber grating 705) to each band. One of ordinary skill in the art would have been motivated to do this since so that the signals in these wavelength bands may be temporally aligned, or "in phase." Such alignment is important for communication systems that rely on

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synchronous processes to handle multi-channel WDM signals (Bergano, e.g., Synchronous Digital Hierarchy signals, col. 1, l. 26-28, col. 3, l. 12-14).

**Regarding claims 17**, claim 17 introduces limitations that correspond to limitations introduced by claim 8. An obviousness argument is applied to address these limitations in claim 8. A similar argument is applied here to claims 17.

**Regarding claim 18**, Bergano in view of Ramaswami discloses:

A device according to claim 17, in which the delay element is a length of optical fibre (length of the fiber portion between the wavelength band reflected by fiber gratings 704 and the wavelength band reflected by fiber grating 705) coupled between the dispersion compensation element and the optical reflector.

13. **Claim 15** is rejected under 35 U.S.C. 103(a) as being unpatentable over Bergano.

**Regarding claim 15**, Bergano does not expressly disclose:

A device according to claim 9, in which the dispersion compensation element is a photorefractive element.

However, it is known that one of the dispersion compensation elements of Bergano, fiber grating 704, is conventionally made from photorefractive materials. Accordingly, fiber grating 704 would comprise a photorefractive element.

14. **Claims 19-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura (U.S. Patent No. 5,793,917) in view of Bergano.

**Regarding claim 19**, Yoshimura discloses:

A dispersion compensating device (Figs. 4-5) comprising a housing having at least one spool of dispersion compensation fibre arranged axially within the housing so as to provide a passage extending along a length of the housing through the core of the spool.

Yoshimura does not expressly disclose:

said dispersion compensating device being according to claim 9.

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Yoshimura discusses the transmission of an optical signal with one wavelength (col. 6, l. 15-35). However, Bergano discusses the transmission of an optical signal with multiple wavelengths, WDM transmissions (col. 1, l. 13-24). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to implement WDM transmissions in the device of Yoshimura. One of ordinary skill in the art would have been motivated to do this since it is extremely well known that WDM transmissions greatly increase the capacity of a system by a factor equal to the number of additional wavelengths. Additionally, the fit is further apparent since the device of Yoshimura already has basic infrastructure that encourages WDM transmissions. For example, the system of Yoshimura uses erbium-doped fiber amplifiers (EDFAs) (repeaters 105 in Fig. 17, optical amplifiers in Fig. 4), and Bergano teaches that the use of EDFAs increase the interest in WDM transmissions (col. 1, l. 13-16) and that EDFAs are particular useful for WDM transmissions because of their ability to amplify multiple wavelength channels without crosstalk penalty (col. 1, l. 21-24).

The device of Yoshimura compensates for dispersion according to a technique that Bergano calls, “dispersion mapping” (note that the dispersion compensation of Fig. 17 of Yoshimura fits the “dispersion mapping” in col. 1, l. 41-65 of Bergano). However, even with advantageous WDM transmissions, Bergano teaches that dispersion mapping is limited (col. 1, l. 65 – col. 2, l. 8). Thus, Bergano discloses a dispersion compensating device according to claim 9 (see treatment of claim 9 above). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to incorporate the dispersion compensating teachings of Bergano in the dispersion compensating device of Yoshimura. One of ordinary skill in the art would have been motivated to do this since these teaching of Bergano enables an advantage over known dispersion mapping techniques (col. 2, l. 23-26). That is, the advantage is that more WDM data channels reside near a wavelength corresponding to the average zero dispersion wavelength, which leads to lower dispersion for the WDM data channels, which can lead to less crosstalk (col. 1, l. 41-44) and lower/fewer limitations by nonlinear interactions between channels (col. 1, l. 44-47).

**Regarding claim 20**, Yoshimura in view of Bergano discloses:

A device according to claim 19, in which the housing is a submarine housing (abstract).

**Regarding claim 21**, Yoshimura discloses:

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A device according to claim 20, in which the submarine housing is a casing for an optical repeater (col. 6, l. 51-63).

**Response to Arguments**

15. Applicant's arguments, filed on 05 January 2005 with respect to the claims that were rejected under Delavaux, have been considered but are moot in view of the new ground(s) of rejection. Note the new rejections under Bergano, Ramaswami, and Yoshimura.

**Conclusion**

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jung is cited to show a related apparatus for receiving an optical signal having a number of channels separated by wavelength and for applying dispersion compensation to an optical path that carries a wavelength band spanning a plurality of channels numbering less than the total number of channels in the optical signal, thereby applying dispersion compensation to the wavelength band independently of wavelengths outside the wavelength band.

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DSK

  
**M. R. SEDIGHIAN**  
**PRIMARY EXAMINER**